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The Preparation of Curare by the Nambicuara
/Préparation du Curare par les Nambikwara/

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278 Numerous travelers and physiologists have concerned themselves with curare without succeeding in exactly determining its nature and its method of preparation. For some curare is purely vegetable; for others it appears to be composed largely of animal materials. Without analyzing here all the literature on this subject, it will be enough to recall that most former authors and travelers of the past century name diverse species of Strychnos as the principal base of curare; many other plants belonging to various families have also been mentioned as possibly entering in this poison. The partisans of an animal or mixed origin for curare, practically all travelers, assert that the venoms of snakes, batrachians, and arachnids, and fish and insect extracts, etc.... play an essential role in its preparation. Despite numerous opinions to the contrary the presence at least of certain venoms in some curares (1) is indisputable.

[113]

1. Vellard and Anis, "Études immunologiques sur le curare /Immunological Studies on Curare/." Annales de l'Institut Pasteur. Paris, LII, 102, 1934.

Often these controversies on the composition of curare have lost sight of one essential fact. Curare is not a set substance and does not correspond to one single formula. There is not one but a number of curares, more or less complex, peculiar to each region, each tribe, and in many cases to each preparer.

Besides it is the general but false practice to call every paralyzing arrow poison of South America curare. The application of this term should be limited, in accordance with its classical physiological definition, to any poison suppressing the passage of excitations of the nerve to the muscle while preserving direct excitability of the muscle and that of the motor nerve.

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True curares are becoming difficult to find. Many of the modern products brought back as curares or existing under this name in /212/ trade are paralyzing poisons of variable toxicity but with a weak or no curarizing effect. The curarizing effect itself does not interest the Indian; he is only looking for a halting poison producing rapid paralysis with loosening of muscular tonus, no matter by what mechanism, for his arrows. Often also the good faith of travelers has been betrayed and the Indians, anxious about their secret, have given them false recipes or poisons different from true curare. Lastly, some curares are hard to preserve, making it impossible to ascertain their properties upon the return of expeditions.

These causes, so diverse, have always left doubt about the exact composition and method of preparation of curare.

I. Curare of the Ñambikwara /Nambicuara/

During my last trip to the central plateau of the Mato Grosso with my colleague Lévi-Strauss, I was present at the preparation of a very simple but active curare by the Ñambikwara and accompanied these Indians on the search for the necessary plants.

Curare had not been mentioned as existing among the Ñambikwara. The Rondon Commission had certainly observed the existence of an arrow poison among them, but later investigations carried out on arrows sent to Rio de Janeiro had given negative results (Alvaro Osorio de Almeida and Roquette Pinto). The cause of this failure can only be attributed to the material used in the experiments, which was too old; the arrows keep their activity only a few weeks.

The composition of curare is the same for all the Ñambikwara, but its method of preparation varies from group to group. It must be emphasized that the preparation of this poison is surrounded with more mystery as one goes toward the

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278 187 southern boundary of the territory of these Indians toward the Amazon. Among the most remote Ñambikwara, those on the right bank of the Rio Juruena whose material culture is extremely poor and who do not have a sorcerer, all the men know how to prepare curare. Among the Tagnani living in the region of Campos Novos and the Rio October 12 and the Çabanè living between the campos of Vilhena and the Rio Commémoration, the preparation of curare is reserved either for the chief or more often for the sorcerer (Çabanè). The Tamandé of the Roosevelt River have refused to give any precise information on curare, the preparation of which is the exclusive prerogative of the sorcerer; their arrow poison, which I was able to study, is identical to that of the other groups. The Ñambikwara of the Cabixi River also use curare, but I did not obtain /213/ any details about its preparation from these Indians, who visited our camp but spent only one evening there.

278 126 [114] I was present at the preparation of curare for the first time among the Ñambikwara of the right bank of the Rio Juruena.

Among the objects gathered for our collections were several poisoned arrows. The first experiments carried out on various animals either with the arrows or with the wash-water of the points revealed a symptomatology recalling that of curare.

[116] [117] Our two chief informants, who were called José Maria and Julio by the civilized people, were influential personages in the group and the principal authors of the massacre of the North American, Protestant mission of the Juruena in 1930.

[120] Patient negotiations led them to show me the plant used by them, and then a little later, to let me be present at the preparation of the poison itself.

Not without fear of being hoaxed, I tested the prepared product: its action was identical in every respect to that of the arrow poisons. The Ñambikwara had been honest.

[121] [122] Two months later in the campos of Vilhena the Çabanè sorcerer, who belonged to the mixed group composed of the

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last Çabanè-Tagnani survivors, again showed me the complete preparation of curare. All the information gathered in the various Nambikwara groups visited agrees with what I was able to observe.

In possession of these facts I prepared several times a certain quantity of curare identical to that of the Nambikwara. The action of these different samples was tested in the field in order to be used in comparison with later experiments upon the return of the mission; thus any possibility of error due to a possible alteration of these products was eliminated.

A year has gone by since this time, and the various solutions brought back have kept their activity; they made it possible to examine rigorously their curarizing properties.

Preparation of Curare

Plant. Nambikwara curare is prepared with only one plant, a Strychnos which grows in the sandy brushwood of the central plateau of the Mato Grosso. Although not rare this species is not abundant anywhere.

It is a bush two meters high (Pl. III. A), with a rather strong stem and downward-hanging branches, more or less sarmentous and sometimes changing into tendrils at the ends; I never saw a really twining example of this species. The branches have a reddish bark, /214/ without thorns, which is covered, as is the stem, with white concretions. The leaves are elongated and small or medium in size. The species is very polymorphous. No specimen bore flowers or fruit.

The Strychnos group is one of the most difficult to study. Many species rarely flower, and in the absence of flowers it is often impossible to identify them.

In certain features the species of the Nambikwara is comparable to St. medeola. It exists in the plant collection of the Rondon Commission, but also without flowers and undetermined.

Çabanè

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278 Only the bark of the roots impregnated with a reddish,
827 gummy juice is used in the preparation of curare. The plants which grow in sandy places are considered to be richer in poison; they are recognized by the bright red color and moisture exuding from incisions made in the bark. Roots from clayey earth are dry and considered incapable of giving an active product.

The Nambikwara of the Juruena consider it essential to gather the roots in the morning at dawn before the sun gets too hot, and they only use fresh bark. The Çabanè use dried, stored bark by preference.

Çabanè Curare

278 The preparation of Çabanè curare may be taken as typical. It comprises three main operations: draining of the bark in portions with fresh water; rapid boiling to rid the product of some of its impurities; slow concentration at low heat.

[Hq] Immediately after their harvest the roots are washed and then scraped with a splinter of bamboo or a piece of iron to detach the bark. Small, very fine shavings are thereby obtained which are dried and kept in baskets or gourds.

[Hq] Draining of the bark. The bark is placed in a small, elongated basket (ḫoṇoṇimatá) of bamboo lamellae reinforced by large leaves (ḫoṇoḫompá) and hung by two vertical supports over an earthen dish. Over the bark they pour 200 to 250 cubic centimeters of cold water; a blood-red liquid filters off slowly. The filtering takes 15 to 20 minutes; when it is almost over fresh water is again poured over the bark. This operation is repeated six to eight times until the bark is exhausted (Pl. IV, A-B).

[Hq] Boiling on a brisk fire. After each operation the liquid obtained is poured into a receptacle placed directly over a strong fire; it is constantly /215/ stirred with a wooden spatula and does not take long to boil in large bubbles. When it

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228 threatens to overflow it is removed from the fire for a second and then put back to boil. A thick, reddish scum forms which holds the largest impurities; it is removed as it appears with a straw from a palm tree (Pl. V, A). After five to ten minutes on an average the boiling diminishes; the liquid turns brown and begins to thicken. It is then taken from the fire and poured with the aid of a funnel (kʷil) made from a rolled leaf into a new receptacle to be concentrated (Pl. IV, C).

Concentration. The concentration is done in a receptacle here, a tin can from the mission) suspended 40 or 50 centimeters above a small fire, into which successive portions of liquid are added as they are prepared. The concentration takes two to three hours. According to its degree /of concentration/ they obtain a thick blackish-brown liquid, reddish when looked through, ready to be applied to the arrows with a straw, or a black paste which becomes very hard on cooling and can be kept for a long time. Before being used this paste must be softened at low heat.

The Çabaré recommend that one not touch the curare with the fingers nor even breathe the steam from it during the boiling. This hypothetical toxicity of the steam had already been noted by former travelers; it was even asserted that these emanations were so dangerous that the Indians had the curare prepared by old women who almost always succumbed to it. One can see (Pl. V, A) that the Çabaré sorcerer is not afraid of it.

Curare does not enter healthy skin, and the Nambikwara of the Juruena press the water-soaked bark between their hands, taking the sole precaution of washing immediately afterward. The steam that I voluntarily inhaled never caused me the least sickness.

The Çabaré call curare and the plant which produces it irîwa, and the still unconcentrated liquid from soaking iriwiya. The Tagnani name the plant and the curare nalâ.

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278 Curare of the Ñambikwara of the Rio Juruena

The technique of the Ñambikwara of the right bank of the Rio Juruena is more primitive.

They use only bark which has just been gathered. The draining off of the bark is done only once and with warm water: the bark /216/ is put on the fire in a rather large amount of cold water, and the operation is ended when the temperature reaches 37° to 40° /centigrade/. It is filtered quickly by squeezing the bark with the hands to extract all the liquid from it. Then comes rapid boiling over a high fire and skimming. After several minutes of a rolling boil the fire is lowered and the liquid kept at a temperature a little below boiling until it has a pasty consistency.

[415 237] The curare is kept in paste form in bamboo tubes or changed into a very hard mass by the addition of meliponine beeswax.

This method exposes the curare to strong heat for at least two hours. The Çabaxè method reduces this time to ten minutes, the other operations being carried out at low heat. Both produce curares with about the same activity.

[192 411] The Rio Juruena Ñambikwara call curare and the plant a'uffuñ or a'ukiñ; the room ta'ñdisú; the poisoned arrow aurú hiritkatú, and its protective bamboo sheath ajiritkatú.

Utilization of Curare

278 411 The Ñambikwara are not familiar with the blowgun. They use curare to poison large arrows with long, notched points, capped with a protective bamboo sheath. The points of the Tamandé curare arrows are shorter and more slender than those of the other Ñambikwara. They are usually placed in twos, threes, and fours under a single protective sheath.

According to the Indians an arrow's activeness does not last more than three or four months. The curare in paste form is kept for a longer time (close to a year). Hard curare can be kept for years.

/216 cont./

224 The poisoned arrows are intended for hunting certain ani-
278 mals, some large birds, cervids, and especially monkeys.
911 Birds wounded by one of these arrows fall almost immediate-
[344] ly.

A monkey mortally wounded with an ordinary arrow or even a bullet often remains hanging from the branches. Under the action of curare it holds itself immobile at first, then begins to tremble and falls several minutes later (five to 10 at the most) as soon as paralysis is produced.

A peccary or small deer such as the Cervus campestris wounded in the body runs for one or two minutes, then stops exhausted, is attacked by tremors and lies down.

The tapir, very large, resists a long time; it can run for two hours before stopping; hence the Indians do not hunt it with curare.

[344] /217/ The meat of animals killed with curare may be
[352] eaten without harm; the Ñambikwara of the Juruena content themselves with cutting away the flesh around the wound impregnated with poison and colored yellow; the Çabanê do not even take this precaution.

278 Poisoned arrows are also used for war; this is perhaps their
911 principal object among many Ñambikwara groups, who possess
746 only a very few specimens during normal times.

None of the Indians know of an efficacious antidote. According to our informants wounds in the trunk would always be fatal to men. By immediately drawing out the arrow, it might be possible to survive a wound in a limb; in order to make their extraction more difficult, the points of the poisoned arrows, especially those of the Çabanê, are very lightly attached to their shafts.

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Properties of Nambikwara Curare

278 The toxicity of Nambikwara curare is high. Among mammals and birds it provokes an initial sensation of unlocalized irritation accompanied by cramps; the animals are restless and scratch themselves sometimes on one part of the body and sometimes on another. Then tremors appear, at first localized in certain groups of muscles, and then becoming general; in some cases they appear in the form of sudden, intermittent muscular jerks; at a more advanced stage certain muscles begin to fibrillate. Finally paralysis appears; the animal presents a progressive asthenia; it becomes immobile, avoids all movement; soon its paws give way, it sinks down, and the paralysis becomes complete.

The swallowing muscles and those of the larynx are reached very early in the dog; its voice becomes faint, its tongue hangs out of its mouth, saliva is no longer swallowed. The tendinous reflexes disappear first, followed by the ocular reflexes. At the beginning breathing is accelerated, panting; the respiratory movements slow down very rapidly, diminishing in extent; periods of apnea appear, varying for dogs from ten to 60 seconds, and coming closer and closer together. After breathing definitely stops the heart continues to beat for several more minutes. Autopsy has revealed only ordinary lesions of suffocation and a greater or less extended yellow coloration of the muscles at the points of injection.

Claude Bernard's experiment, using a frog, one foot of which was isolated from the general circulatory system by a ligature cutting off the sciatic /nerve/ shows that after an injection of curare into the dorsal lymphatic sack /218/ the mobility of the isolated foot and retention of nerve excitability are preserved.

The curarizing action has been studied in a more precise fashion with solutions brought back with the help of ordinary

/218 cont./

278 inductive apparatus and with the usual equipment for the study of chronaxie at the laboratory of M. Miguel Ozorio de Almeida at the Institute Oswaldo Cruz of Rio de Janiero.

It is known that the South American pseudo-frogs are curarized with difficulty and in an incomplete fashion; toads in contrast the Bufo marinus among others, constitute choice reagents.

After 15 minutes the Bufo marinus (30 to 40 gr.) present perfect curarization, with doses from 0.01 to 0.05 cc. of liquid curare injected into the ventral lymphatic sack: the gastrocnemii no longer react to excitation of the sciatic /nerve/ by the discharge of condensers of five microfarads, nor even to that of a six-volt battery, while keeping their direct excitability.

Lizards are very sensitive; 0.001 to 0.01 cc. curarize Anolis or Tropidurus of average size.

An intramuscular injection of 0.2 cc. paralyzes a hen in two minutes and kills it in 15 to 20 minutes; 0.05 cc. produces a paralysis which only disappears after four or five hours.

Mammals are particularly sensitive to this curare.

A dog of eight kg., having had the end of an arrow point (45 mm.) in his thigh muscles for 15 minutes, immediately after being wounded had tremors localized at first in his forequarters, then they extended to his dorsal muscles. Three minutes later the animal fell; paralysis was complete after 12 minutes; pupillary reflexes disappeared in 15 minutes, the time when the arrow point was extracted; the definite stoppage of respiration occured in 41 minutes, and the heart stopped three minutes later.

A ten-kg. dog who had received an intramuscular injection of 0.25 cc. of solution in tu thigh displayed immediate restlessness and generalized irritation; in three minutes tremors began in the forequarters. The animal staggered (4'), then fell paws outspread (5'). Paralysis of the voice in six minutes and

W 278 /218 cont./ panting respiration; eight minutes, repeated muscular jerks in the forequarters; nine minutes, total paralysis, disappearance of the pupillary and corneal reflexes, tongue hanging out of the mouth; ten minutes, the first periods of apnea; 13 minutes, definite cessation of breathing; 16 minutes, heart stops.

There is no point in further stressing here the physiological action of the arrow poison of the Nambikwara. These few observations suffice to /219/ show that we are dealing with a genuine curare and not with a simple paralyzing poison. Compared with a former curare, in a jar labeled "Indios tapuios do baut Rio Negro /Tapuio Indians of the upper Rio Negro/" Nambikwara curare has shown itself considerably more active. It distinguishes itself from the classic curare of the Ticuuna by the muscular tremors which it produces at the beginning of the poisoning among all the mammals studied.

II. Curare of the Pareci

? 278 P [178] The Pareci Indians, not very numerous and very civilized today, were acquainted with curare. They give it, with almost the same accentuation, the same name as the Çabanê: kiwê.

P [124] [124] I was not able to obtain any as the Pareci no longer prepare it; the information on it was given to me by some middle-aged Pareci, who had spent their youth in some villages which were still independent at this time where the men used this poison.

The chief ingredient was the Strychnos used by the Nambikwara, but accompanied by other plants which my informants did not know or did not want to bother gathering. One of the botanists from the Rondon Commission, Hoehne, cites six species of *Strychnos*, not completely identified plants, which were pointed out to them by a Pareci Indian as entering into the composition of their arrow poison. But this poison did not keep and could not be studied.

Pareci: SP17

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219 539 [191] [124] The Pareci have a story about the discovery of the toxic properties of this Strychnos. A Pareci on a visit to the Utiarity /Utiariti/ station gave me a rather long version of it in Portuguese and a summarized version in Pareci.

Here is the first one:

The old ones said: "A man went hunting and found an armadillo's burrow. The man had a wound in his leg. The man dug to find the armadillo. Suddenly he found an iriwá root. He cut it. He cut several of them. Suddenly the point of a root touched his wound. He died. The roots began to talk; they said 'Who has killed this man?' The big root (the main, taproot) said in a large voice, 'Me, I killed him.' A little root with a thin voice said, 'Me, I killed him.' Then the men carried the root to the village and they knew that it was poisonous."

The second version is much shorter:

makuliá	sikerá	ẽnzá	ẽkpotirauná	iriwá	ẽkére
armadillo	digging	man	wound	poison	root

irikut'á	ẽkpotirauná	/220/	apipá'a	wahini	iriwá
grand	wound		burst	he died	poison

ẽkére	irawená	-sáli a'ẽne	natiá	na'ẽne
root	says	(who has killed) (1)	it is me	I killed

1. I am not very sure about the exact translation of these two words, the informant being a very poor one.

maisá	natiá	na'ẽne.
small	it is me	I killed.

This tale seems to indicate that the Pareci acquired curare perhaps relatively recently. But as our goal was the Nambikwara region, our contacts with the Pareci Indians were very superficial and none of those whom we saw was able to give us more precise information.

/220 cont./

The Tamandé Ñambikwara, of the upper course of the Roosevelt River, assured me that curare had come to them from other Indians living farther to the north, in the region of the Gy Paraná /Gi-Paraná River/; it was not possible to make them specify what kind of Indians these were.

The Cabixiana /Cabishi?/ of the Rio Mequem, to the northeast of Ñambikwara territory, also use curare. According to a civilized Indian of this group encountered at the post of Baron de Melgaço, their product with a complex vegetable base is prepared secretly and only by a few old men; it is a hard curare in a jar. It is used for hunting, even of tapir, and for war.

The Pareci, along with the Ñambikwara, represent the extreme southern point of the spread of curare, the use of which as one goes toward the Amazon becomes more and more frequent and its preparation surrounded with more mystery.

All the curares are not as simple as the Ñambikwara curare, but all appear to have as their principal base a species of Strychnos which varies according to the region. Certain Strychnos such as St. toxifera Benth., Str. lethalis Barb. Rod., and especially St. crevauxiana Baill. are particularly toxic; others like St. pseudo-quina are very low in poisonous elements.

Besides the Strychnos, active elements of curare, of numerous other plants generally poisonous but with very diverse properties, and of animal substances such as venoms, often enter into the composition of this poison. Their addition answers different ends.

Sometimes these are resins or gums whose sole utility is to harden the product and to assure its preservation.

Sometimes they are toxic substances destined to reinforce or to complete the action of the Strychnos.

/221/ In other cases other substances without any actual effect but with magical properties are added to curare. Their nature is infinitely variable.

/221 cont./

In many cases also the complexity of the curare seems to have no other end than to mask the real active elements and to assure the monopoly of its preparation by a few individuals.

We have thus led to divide curares into:

simple curares, with a base solely of Strychnos.

composite curares, in which diverse vegetable or animal elements are added to the Strychnos with the ends: a) of hardening the product. b) of reinforcing its physiological action. c) with magical aims. and d) to conceal its real composition.

The Nambikwara curare represents the most simple type.

Beyond its ethnographic aspect the knowledge of the exact composition of this curare interests physiologists; it will make it henceforth easy to prepare a very active curare with a constant action for research laboratories.

Plate III

A

B

C

D

/see captions on next page/

Available from D.E.S. (1959) 1959 SP17 Hambidge SP17

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Plate III

271 Preparation of curare by the Nhambikwara Indians
(right bank of the Juruena)

A. Stalk of Strychnos sp., the root of which is used to prepare curare.

[16] B. The Nhambikwara Julio digging up a root of iriwa (Strychnos sp.)

C. The Nhambikwara Julio carries back some roots of Strychnos sp.

D. Root of Strychnos sp.

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Çabanè

Plate IV

278
192
415
302
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A

B

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415
516

C

Preparation of Çabanè curare (Vilhena region)

A-B. Draining of the bark with cold water.

C. After boiling the liquid is transferred into another receptacle where it will be concentrated at low heat.

Plate V

A

B

C

D

/See captions on next page./

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BrVellard--1Ta D.E-5 (1958) 1989 SP17 Nambicuara SP17
Çabaxé

Plate V

271 Preparation of Çabaxé curare (Vilhena region)

A. The curare is skimmed during the boiling.

[illegible] B. Testing of the degree of concentration of the product with the aid of a straw.

[illegible] C. Funnel made of a leaf rolled into a horn and the leaf used to make it.

[illegible] D. A pot of grey clay, badly baked, used to prepare and keep curare (Nhambikwara of the Cabixi River).

[For information on the collection of samples of curare and their testing by the author in the field, see category 126.]